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A new *Asterostroma* species (*Basidiomycota*) from a subtropical region in Japan

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Abstract — A new homobasidiomycete, *Asterostroma boninense,* was found in the Bonin (Ogasawara) Islands, a subtropical region in Japan. This species is morphologically characterized by having resupinate basidiomata, a monomitic (asterodimitic) hyphal system, simple septate generative hyphae, dextrinoid asterosetae, four sterigmate basidia, and subglobose, tuberculate, amyloid basidiospores. It is similar to *A. muscicola*, but the latter has smaller basidia. In Japan, *A. muscicola* is widely distributed in warm-temperate to subtropical regions including the Bonin Islands, while *A. boninense* is restricted to the Bonin Islands. Another species in the genus, *Asterostroma andinum*, is also reported as new to Japan. A key to the Japanese species of *Asterostroma* is provided.

Key words — corticioid fungi, *Lachnocladiaceae*, oceanic island, taxonomy

Introduction

The genus *Asterostroma* Massee belonging to the family *Lachnocladiaceae* (*Basidiomycota*) is characterized by resupinate and felted-membranous basidiomata, gloeocystidia, clampless generative hyphae, and dextrinoid asterosetae (asterohyphidia). Based on basidiospore morphology, the genus is divided into two subgenera, *Austroasterostroma* Parmasto and *Asterostroma*. The former produces smooth and inamyloid basidiospores whereas species of the latter have amyloid spores (Parmasto 1970). Furthermore, the subgenus *Asterostroma* is subdivided into two sections, *Laevispora* Parmasto (with smooth basidiospores) and *Asterostroma* (with ornamented basidiospores) (Parmasto 1970, Boidin et al. 1997). According to MycoBank administered by the International Mycological Association (http://www.mycobank.org/),

twenty-six species have been described in *Asterostroma*. Among them, *A. cervicolor* (Berk. & M.A. Curtis) Massee (Aoshima et al. 1963), *A. macrosporum* N. Maek. & Suhara (Suhara et al. 2010), and *A. muscicola* (Berk. & M.A. Curtis) Massee (Suhara et al. 2010) have been earlier reported from Japan. In the present study, we describe a new species of the genus based on specimens collected in the Bonin (Ogasawara) Islands, located about 1000 km south of Tokyo, Japan. Moreover, an additional species of *Asterostroma* is reported as new to Japan.

Materials & methods

The specimens are deposited in the Tottori University Fungal Herbarium (TUFH) and the cultures in the Tottori University Mycological Culture Collection (TUMC). Morphological observations were carried out as described in Suhara et al. (2010). Color names in double quotation marks are based on Rayner (1970). The notation "basidiospores (n = 60/3)" indicates that measurements were made on 60 spores from 3 specimens. Polysporous isolates obtained from each specimen were grown on malt extract agar [MA; 1.5% (w/v) malt extract and 1.5% (w/v) bacto agar, Difco, Detroit, MI, USA]. To determine the optimum growth temperature, the isolates were grown on MA plates at 8 different temperatures: 4, 10, 15, 20, 25, 30, 35 and 40°C.

Taxonomy

Asterostroma boninense Suhara & N. Maek., **sp. nov.** Figs. 1–7

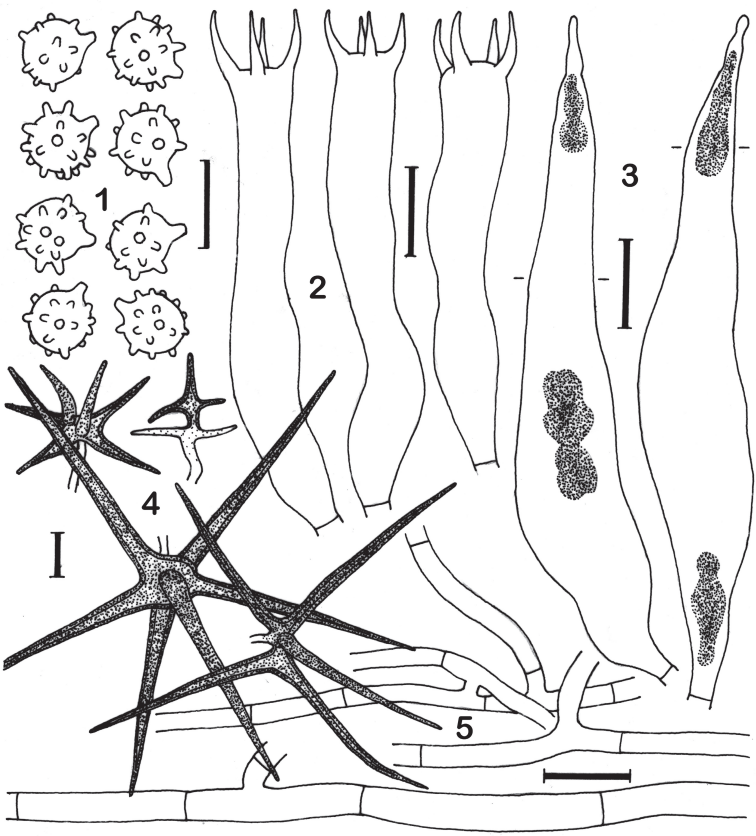
MycoBank 518641

Basidiomata resupinata, adnata, effusa, mollia, 200–600 µm crassa; superficies hymenialis "Buff" vel "Ochreous" (sec. Rayner 1970), laevis, sub lente (×20); margo "Ochreous", "Fulvous" vel "Cinnamon", tenuescens, interdum fimbriatus, filis hyphalibus tenuibus nonnumquam. Systema hyphale monomiticum; hyphae generatoriae cum septis, sine fibulis, 1.5–5 µm diametro, laeves, tenui-vel parum crassitunicatae (usque 0.5 µm), simpliciseptatae; asterohyphidia numerosa, radii ad 110 µm longi. Cystidia (gloeocystidia) parum numerosa, subcylindracea, ventricosa vel fusoidea, 43–95 × 7.5–16 µm. Basidia subcylindrica vel utriformia, 40–60 × 6.5–8.5 µm, 4 sterigmata gignentia. Basidiosporae subglobosae apiculo distincto armatae, 5.5–7.5 × 5–7.2 µm (praeter tuberculis), tubercula (tuberculis usque ad 1.5 µm longi), tenuitunicatae, amyloideae.

Type: **JAPAN. Tokyo: Ogasawara-mura**, Takinoura (Anijima Island), on dead trunk of *Clinostigma savoryanum* (Rehder & E.H. Wilson) H.E. Moore & Fosberg (*Arecaceae*), 6 Dec 1997, coll. N. Maekawa. (**Holotype**, TMI20619; ex-type culture (polysporous), TUFC33876).

Etymology: The specific epithet *boninense* refers to the geographic origin of the type specimen.

Basidiomata resupinate, loosely adnate, effused, soft, felt-like, 200–600 µm thick; hymenial surface "Buff", partly "Ochreous", smooth, pruinose under



Figs 1–5. Line drawings of *Asterostroma boninense* (TMI20619, holotype): 1. Basidiospores; 2. Basidia; 3. Cystidia (gloeocystidia) – short horizontal lines indicate the level of the hymenial surface; 4. Asterohyphidia (asterosetae); 5. Subicular hyphae. Scale bar = 10 μm.

the lens (×20), sometimes slightly cracked when dried; margin "Ochreous", "Fulvous" to "Cinnamon", determinate, but sometimes thinning out, fimbriate, occasionally with thin hyphal strands concolorous with the margin under the lens (×20). Context in vertical section ocher, pellicular to submembranous, the subiculum sometimes with thin hyphal strands and/or containing crystals. Hyphal system monomitic (asterodimitic); generative hyphae 1.5–5 μm in diameter, smooth, thin- to slightly thick-walled (up to 0.5 μm), clampless-septate, loosely intertwined in the subiculum; asterohyphidia (asterosetae)

numerous in the subiculum and subhymenium, subhyaline to brownish, 2–10 diverging branches, the branches acicular to subulate, up to 110 µm in length; cystidia (gloeocystidia) subcylindrical, ventricose to fusiform, sometimes with schizopapillae, 43–95 × 7.5–16 µm, without a basal clamp, thin-walled, with pale yellowish oily contents, imbedded in the basidiomata, but sometimes projecting 30 µm beyond the hymenial surface; basidia (n = 60/3) subcylindrical to utriform, 40–60 × 6.5–8.5 µm, thin-walled, without a basal clamp, consistently producing 4 sterigmata; basidiospores (n = 60/3) subglobose, 5.5–7.5 × 5–7.2 µm (excluding tubercles), with a distinct apiculus, tuberculate (tubercles up to 1.5 µm in length), thin-walled, amyloid.

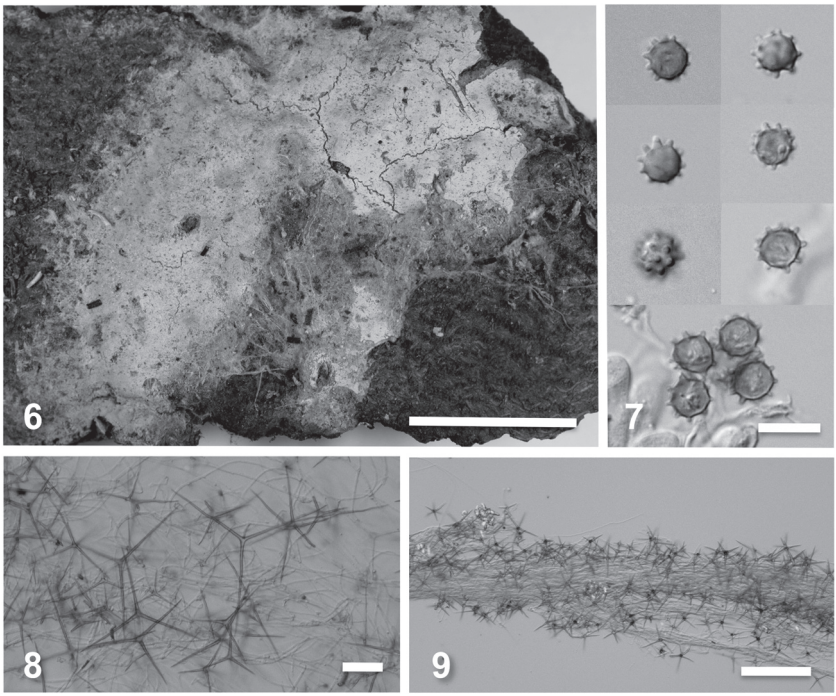
Distribution — So far only reported from the Bonin Islands (Japan).

Cultural characteristics —Optimal temperature for the four polysporous isolates examined was 25–30°C (see Type and Additional specimens examined). These isolates grew between 10 and 30°C, with no visible growth observed at 4, 35, or 40°C. Growth rate on MA: 6.7–15 mm after 1 w (25°C).

> Additional specimens examined: **JAPAN. Tokyo: Ogasawara-mura**, Minamizaki (Hahajima Island), on dead wood of *Livistona boninense* (Becc.) Nakai (*Arecaceae*), 12 Dec 1997, coll. N. Maekawa, TMI20570 (polysporous culture, TUFC33791); Takinoura (Anijima Island), on dead trunk of *L. boninensis*, 6 Dec 1997, coll. N. Maekawa, TMI20620 (polysporous culture, TUFC33877); Mt. Shigure (Chichijima Island), on dead branch of *Pandanus boninensis* Warb. (*Pandanaceae*), 3 Dec 2006, coll. N. Maekawa, TUMH40170 (polysporous culture, TUFC10922).

Mycelial mats white, partly pale salmon to "Flesh", cottony to woolly at 2 w, and then becoming partly floccose, "Rosy Vinaceous" to "Dark Vinaceous", sometimes with white, thin, hyphal strands, occasionally farinaceous around the inoculum; agar medium stained "Vinaceous" around the inoculum at 6 w; margin even, raised, with irregularly fan-like extensions; odor crayon-like; no fruiting by 6 w. Surface and aerial hyphae hyaline, 2.5–3.5 µm in diameter, smooth, thin-walled, clampless-septate, sparsely branched, sometimes with yellow to reddish brown oily contents, producing abundant subhyaline to pale brown asterohyphidia (Fig. 8), occasionally producing tubular gloeocystidium-like cells and gloeoplerous to swollen (monilioid) cells, up to 20 µm in diameter filled with hyaline oily contents. Hyphae of the hyphal strands hyaline to subhyaline, 1–3 µm in diameter, smooth, thin-walled, clampless-septate, sparsely branched, producing numerous subhyaline to pale brown asterohyphidia (Fig. 9), sometimes containing crystals in hyphal strands. Submerged hyphae hyaline to subhyaline, partly becoming pale "Vinaceous", 1–2.5 µm in diameter, smooth, thin-walled, clampless-septate, branched, sometimes capilliform-like; skeletal and binding hyphae absent.

Species code (Nakasone 1990): 6. 15. 16. 19. 26. 28. 29. (31.) 36. 39. 44. 49. 53. 54.



Figs 6–9. Photographs of *Asterostroma boninense*: 6. Basidioma (TMI20619, holotype); 7. Basidiospores stained with Melzer's reagent; 8. Asterohyphidia produced in cultural mycelium (6 w); 9. Hyphal strand with asterohyphidia produced in culture (6 w). Scale bars: 6 = 1 cm; 7, 8 = 10 μm; 9 = 100 μm.

Discussion

Asterostroma boninense is primarily characterized by having asterohyphidia and tuberculate, subglobose, amyloid basidiospores. Its amyloid and ornamented basidiospores places this species into subg. *Asterostroma* sect. *Asterostroma*. Within this section, the species resembles *A. muscicola* and *A. macrosporum* in forming subglobose basidiospores with subcylindrical to obtuse ornaments. However, Gilbertson & Blackwell (1987) and Boidin et al. (1997) measured the basidia of *A. muscicola* at 25–32 × 6–8.5 μm and 18–24 × 5–6 μm respectively; the distinctly larger basidia in *A. boninense* [40–60 × 6.5–8.5 μm (50 ± 7.4 × 7.4 ± 0.5 μm, n = 60/3)] differentiate the new species from *A. muscicola* [27–41 × 5–7.5 μm (34.2 ± 3.8 × 6.3 ± 0.7 μm, n = 40/2)]. Furthermore, *A. boninense* specimens have been collected only from dead monocotyledonous angiosperm tree trunks and branches, e.g., endemic species of *Clinostigma*, *Livistona,* and *Pandanus* in the Bonin Islands (located in subtropical region of Japan). On the

other hand, *A. muscicola* occurs both on angiospermous and gymnospermous slash (Gilbertson et al. 1974, Gilbertson & Blackwell 1987) and is distributed in subtropical to warm-temperate regions in Japan (Suhara et al. 2010).

Asterostroma boninense also resembles *A. macrosporum* in basidial shape and size except that in the latter basidiospores are distinctly larger (8.5–11 × 7.5–9 µm) than those of *A. boninense*. In addition, *A. macrosporum* has been collected only from mangrove trees on Iriomote Island, approximately 1,600 km west of the Bonin Islands (Suhara et al. 2010).

We also recognized *A. andinum* Pat. as a species new to Japan based on two specimens, TMI19638 and TUMH40171, collected in Hokkaido and the Bonin Islands, respectively. This species, which has a worldwide distribution, is placed in sect. *Laevispora*. *Asterostroma andinum* is primarily diagnosed by subglobose to globose basidiospores measuring 6–7.5 × 5–6.5 µm and asterosetal rays measuring 30–130 × 4–8 µm. The morphologically similar *Asterostroma laxum* Bres. produces smaller rays measuring up to 40 µm in length (Parmasto 1970, Boidin et al. 1997).

The features distinguishing *Asterostroma* species reported from Japan can be found in the following key.

Key to species of the genus *Asterostroma* in Japan

1. Basidiospores smooth, subglobose ..... ***A. andinum***
1. Basidiospores ornamented 2
2. Basidiospores subglobose, 4.8–6 × 4–5 µm ..... ***A. cervicolor***
2. Basidiospores subglobose to globose, larger (up to 8 × 8.5 µm or more), with subcylindrical and obtuse ornaments 3
3. Basidiospores 8.5–11 × 7.5–9 µm; basidiomata only on mangrove trees ..... ***A. macrosporum***
3. Basidiospores smaller than 8.5–11 × 7.5–9 µm 4
4. Basidia 40–60 × 6.5–8.5 µm; basidiomata on monocotyledonous trees of angiosperms ..... ***A. boninense***
4. Basidia 18–41 × 5–8.5 µm; basidiomata both on angiosperms and gymnosperms ..... ***A. muscicola***

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Literature cited

Aoshima K, Hayashi Y, Furukawa H. 1963. The genera *Asterodon* and *Asterostroma* of *Hymenochaetaceae* (in Japanese). Trans. Mycol. Soc. Jpn. 4: 136–140

Boidin J, Lanquetin P, Gilles G. 1997. Contribution a la conassance du genre *Asterostroma* Massee 1889 (*Basidiomycotina*). Bulletin trimestriel de la Société mycologique de France 113: 269–301

Gilbertson RL, Blackwell M. 1987. Notes on wood-rotting fungi on junipers in the Gulf Coast region. II. Mycotaxon 28: 369–402

Gilbertson RL, Martin KJ, Lindsey JP. 1974. Annotated check list and host index for Arizona wood-rotting fungi. Univ. Arizona Agaric. Exp. Sta. Techn. Bull. 209: 1–48

Nakasone KK. 1990. Cultural studies and identification of wood-inhabiting *Corticiaceae* and selected hymenomycetes from North America. Mycologia Memoir No.15. Gebrüder Borntraeger, Berlin

Parmasto E. 1970. The *Lachnocladiaceae* of the Soviet Union. With a key to the boreal species. Tartu, Estonia

Rayner RW. 1970. A mycological color chart. Commonwealth Mycological Institute and British Mycological Society, Kew, Surrey

Suhara H, Maekawa N, Ushijima S, Kinjo K, Hoshi Y. 2010. *Asterostroma* species (*Basidiomycota*) from mangrove forests in Japan. Mycoscience 51: 75–80. doi:10.1007/s10267-009-0006-2